

## CLAIMS

We claim:

*Sub c2*

1. A process of making polytrimethylene terephthalate staple fibers, comprising (a) providing polytrimethylene terephthalate, (b) melt spinning the melted polytrimethylene terephthalate at a temperature of 245-285°C into filaments, (c) quenching the filaments, (d) drawing the quenched filaments, (e) crimping the drawn filaments using a mechanical crimper at a crimp level of 8-30 crimps per inch (3 - 12 crimps/cm), (f) relaxing the crimped filaments at a temperature of 50-120°C, and (g) cutting the relaxed filaments into staple fibers having a length of about 0.2-6 inches (about 0.5 - about 15 cm).
2. The process of claim 1 wherein the temperature of the relaxation is below about 105°C.
3. The process of claim 1 wherein the temperature of the relaxation is about 55 - about 105°C.
4. The process of claim 1 wherein the temperature of the relaxation is about 60 - about 100°C.
5. The process of claim 1 wherein the relaxation is carried out by heating the crimped filaments in an unconstrained condition.
6. The process of claim 1 wherein the drawn filaments are annealed at 85-115°C before crimping.
7. The process of claim 6 wherein the annealing is carried out under tension using heated rollers.
8. The process of claim 1 wherein the staple fibers are 0.8-6 denier per filament.
9. The process of claim 1 wherein the staple fibers are 0.8-3 denier per filament.
10. The process of claim 9, wherein the drawn filaments are annealed at 85-115°C before crimping and the staple fibers have a tenacity of at least 4.0 grams/denier (3.53 cN/dtex) or higher.
11. The process of claim 10 wherein the staple fibers have an elongation of 55% or less.
12. The process of claim 1 wherein the process is carried out without annealing and the staple fibers have a tenacity of at least 3.5 grams/denier (3.1 cN/dtex).
13. A polytrimethylene terephthalate staple fiber of 0.8-3 denier per filament having a length of about 0.2-6 inches (about 0.5 - about 15 cm), a tenacity of 3.5 grams/denier (3.1 cN/dtex) or more and a crimp take-up of 10-

60%, containing 8-30 crimps per inch (about 3 – about 12 crimps/cm), prepared by the process of claim 13.

14. A 0.8-3 denier per filament polytrimethylene terephthalate staple fiber having a tenacity of 4.0 grams/denier (3.53 cN/dtex) or higher.

5 15. A polytrimethylene terephthalate staple fiber as claimed in claim 14 wherein the staple fiber has an elongation of 55% or less.

16. Textile yarn prepared with the fibers of claim 13.

17. Textile yarn prepared with fibers of claim 15.

18. Textile or nonwoven fabric prepared with the fibers of claim 13.

10 19. Textile or nonwoven fabric prepared with the fibers of claim 15.

20. Textile or nonwoven fabric as claimed in claim 18 further comprising fibers selected from the group consisting of cotton, polyethylene terephthalate, nylon, acrylate and polybutylene terephthalate fibers.

15 21. A process of preparing a polytrimethylene terephthalate staple fiber having a desirable crimp take-up comprising (a) determining the relationship between denier and crimp take-up and (b) manufacturing staple fibers having a denier selected based upon that determination.